

Mesoplodon stejnegeri.

By Thomas R. Loughlin and Michael A. Perez

Published 13 December 1985 by The American Society of Mammalogists

Mesoplodon Gervais, 1850

- Aodon* Lesson 1828:155, 440, pl. 3, fig. 1. Type species *Aodon dalei* Lesson (= *Physeter bidens* Sowerby, 1804). Not *Aodon* Lacépède, 1802, a fish.
- Micropterus* Wagner 1846:281, 352, pl. 348. Type species *Delphinus micropterus* Cuvier (= *Physeter bidens* Sowerby, 1804). Not *Micropterus* Lacépède, 1802, a fish.
- Micropteron* Eschricht 1849:97. Type species *Delphinus micropterus* Cuvier (= *Physeter bidens* Sowerby, 1804). Incorrect subsequent spelling of *Micropterus* according to Rice and Kinman (1980).
- Mesoplodon* Gervais 1850a:16. Type species *Delphinus sowerbensis* Blainville (= *Physeter bidens* Sowerby, 1804) by designation. *D. sowerbensis* was proposed unnecessarily as a replacement name for *Physeter bidens* Sowerby, 1804.
- Dioplodon* Gervais 1850b:512. Type species *Delphinus densirostris* Blainville.
- Mesiododon* Duvernoy 1851:41, pl. 2, fig. 2. Type species *Dioplodon sowerby* Gervais (= *Physeter bidens* Sowerby, 1804).
- Mesiodon* Gray 1866:349. Misspelling of *Mesiododon* Duvernoy 1851.
- Diplodon* Gray 1866:349. Misspelling of *Dioplodon* Gervais 1850.
- Dolichodon* Gray 1866:353, fig. 72. Type species *Ziphius layardii* Gray.
- Callidon* Gray 1871a:368. Type species *Mesoplodon güntheri* Krefft (= *Ziphius layardii* Gray).
- Neoziphius* Gray 1871b:101. Type species *Dioplodon europaeus* Gervais (= *D. gervaisi* Deslongchamps).
- Oulodon* von Haast 1876:457. Type species *Mesoplodon grayi* von Haast.
- Paikea* Oliver 1922:574. Type species *Berardius hectori* Gray.

CONTEXT AND CONTENT. Order Cetacea, Suborder Odontoceti (considered an order by some authors), Family Ziphiidae. The family contains the extant genera *Berardius*, *Hyperoodon*, *Indopacetus*, *Tasmacetus*, and *Mesoplodon*. The genus *Mesoplodon* contains 11 living species. The following key for *Mesoplodon* in the northern hemisphere was adopted from Moore (1966):

- 1 One or both premaxillary foramina open on or below a horizontal plane that transects the centers of maxillary foramina 2
 - Premaxillary foramina both open above such a line 4
- 2 (1) Length of vomer visible on palate less than 90 mm *M. europaeus*
 - Length of vomer visible on palate more than 100 mm 3
- 3 (2) From inside view of the antorbital tubercle the lacrimal bone appearing reduced to a thin layer wrapped around anterior end of frontal *M. mirus*
 - Lacrimal thicker and not wrapped around frontal *M. ginkgodens*
- 4 (1) On vertex of skull, right premaxilla extending posteriorly beyond right nasal less than 0.75 of length of right nasal on vertex 5
 - Right premaxilla extending posteriorly beyond right nasal a distance equal to at least 0.75 of dorsal length 6
- 5 (4) Anterior portion of jugal (malar) not curling up in front of edge of maxillary in the antorbital notch *M. bidens*
 - An anterior tongue of jugal rising up in front of anterior edge of maxillary *M. carlhubbsi*
- 6 (4) Both lateral and mesial margins of spiracular plate continuous with plane of dorsal profile of beak in lateral view *M. densirostris*
 - Lateral margin of spiracular plate continuous with the plane of dorsal profile of beak in lateral view, but mesial margin rising posteriorly *M. stejnegeri*

A southern hemisphere form, *M. hectori*, recently was described as occurring in the warm-temperate waters of the North Pacific Ocean (Mead, 1981). *Mesoplodon stejnegeri* and *M. hectori* are superficially similar in cranial appearance in that both lack the prominent notch but differ in that the teeth of *M. hectori* are near the anterior tip of the jaw and are smaller and more triangular in lateral view than in *M. stejnegeri*.

Mesoplodon stejnegeri True, 1885

Stejneger's Beaked Whale

Mesoplodon stejnegeri True, 1885:585. Type locality U.S.S.R., Commander Islands, Bering Island.

CONTEXT AND CONTENT. Context given above. The species *M. stejnegeri* is not divided into subspecies (Moore, 1963, 1966).

DIAGNOSIS. The skull (Fig. 1), in lateral view, shows the profile of the premaxillaries to take an abrupt turn anteriorly, forming about a 90° turn in the dorso-anterior face (Moore, 1963). In anterior view, the 90° turn is a deep crease that descends laterad about 20° from horizontal (Moore, 1963, 1966). The right premaxilla extends posteriorly on the vertex a distance exceeding 0.75 of the dorsal length of the right nasal. The right antorbital notch makes an obtuse angle of more than 100°. The proximal ascension of the premaxillae is tipped forward about 70° or until about 20° (no more than 30°) from vertical (Moore, 1963). The lateral margin of the spiracular plate extends posteriorly in a horizontal plane; the mesial margin of this plate ascends posteriorly (Moore, 1963). Prominent notches are absent (Moore, 1963). The maxillary prominences rise only 5 to 9 mm higher than the height of the premaxillaries. Both dorsal and ventral profiles of the beak are virtually straight lines (Moore, 1966). The apex of the antorbital tubercle is composed of, from top to bottom, maxillary, frontal, lacrimal, and jugal (Moore, 1963). The basal portion of the rostrum is long and the inner notches are shallow (Harmer, 1924). A transverse plane, perpendicular to the long axis of the rostrum and transecting the apex of the left antorbital notch, also nearly transects the anteriormost point reached by the pterygoid sinus (Moore, 1963, 1966).

The anterior lip of the alveolus is posterior to the mandibular symphysis. The root of the tooth becomes progressively shorter from anterior to posterior. Apex of the tooth, when viewed from the side, is on line with the anterior margin of the tooth.

The five species of *Mesoplodon* that occur in the North Pacific cannot be distinguished in the field at present; identification to specific level requires close examination, although on geographical grounds the species can sometimes be inferred (Gaskin, 1971; Leatherwood et al., 1982; Loughlin et al., 1982). *M. stejnegeri* may be confused at sea with the goose-beaked whale, *Ziphius cavirostris*, but can be distinguished by the smaller size of the adult *M. stejnegeri* and by differences in head shape. Adult *Z. cavirostris*, especially males, are paler in color dorsally than *M. stejnegeri*, but the color difference is difficult to distinguish unless viewing conditions are good. *Mesoplodon* spp. can be distinguished from *Berardius bairdii*, the only other ziphiid common in Aleutian Island waters, by the larger size (adults may reach 12.8 m), prominent bulbous melon, and nearly triangular-shaped dorsal fin of *B. bairdii* (*M. stejnegeri*'s dorsal fin is more falcate). *M. stejnegeri* also lacks the characteristic white cap or "beanie" found on the forehead in front of the blowhole of *M. carlhubbsi* (which also occurs in the same waters off Oregon to British Columbia).

GENERAL CHARACTERS. Body form (Fig. 2) is little different from others in the genus with a long, well-defined rostrum, falcate dorsal fin placed well behind the midback, usually no median



FIG. 1. Dorsal, ventral, and left lateral views of the cranium and lateral and dorsal views of lower jaw of MMBL 1968-68, a male *Mesoplodon stejnegeri* found at sea near Cape Edgecombe, Alaska, on 20 May 1968. Photographs by J. Peacock, NMFS.

notch between the flukes, small flippers that fit into a "pocket" when appressed, and a pair of throat creases (Leatherwood et al., 1982; Mead et al., 1982). There is a distinct keel on the tail stock from the anus posterior to the center of the flukes (Nishiwaki, 1972). *M. stejnegeri* has a relatively large thorax, small head, and the forehead anterior to the blowhole appears depressed in lateral view (Mead et al., 1982). The lower jaw may protrude beyond the upper by 1.5 cm (Tomilin, 1957; True, 1910). Because of restrictions of superficial tissue and jaw placement, the mouth can open only a few centimeters and the teeth probably are ineffective during fights when the mouth is open (Heyning, 1984; Mead et al., 1982; True, 1910).

Maximum size for males and females probably is about 5.25 m, although females may be longer than males and have a larger cranium (Leatherwood et al., 1982; Moore, 1963). An immature female was 239 cm long (Nishimura and Nishiwaki, 1964); the largest female and male were both 525 cm long (Mead, 1984).

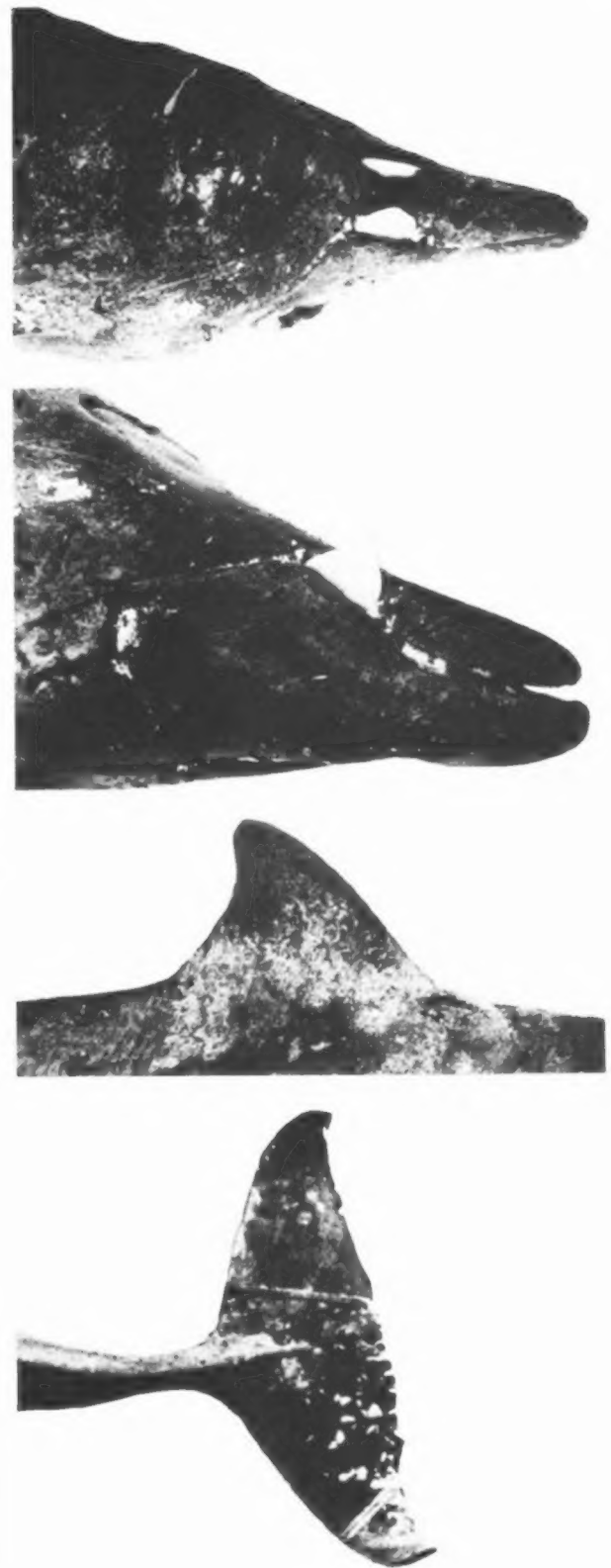


FIG. 2. Photographs of a 525-cm male *Mesoplodon stejnegeri* stranded at Homer, Alaska, on 13 November 1977; from top to bottom: dorsal view of head, lateral view of head, falcate dorsal fin, and caudal peduncle and flukes. Photographs by F. Fay, courtesy of J. G. Mead.

The head in adult females is dark dorsally with some light countershading ventrally (Mead et al., 1982); males are more uniformly dark (Nishimura and Nishiwaki, 1964; Nishiwaki, 1962a). Freshly stranded specimens are grayish-brown on the back and

lighter on the belly and juveniles have striking light brush marks extending up the sides behind the head, neck, and around the mouth (Leatherwood et al., 1982). Animals observed at sea appear pale brown to black with pale brown scars (Loughlin et al., 1982). Adults have oval white scars on the flanks and in the genital region, and males are covered with linear scars, probably resulting from wounds inflicted by contact with the dorsal surface of the rostrum of other males with their mouth closed or, less likely, by the suckers of squid (suborder Teuthoidea) upon which they feed; the smaller oval, light scars may result from dermal parasites, impact with the bottom, lampreys (*Lampetra tridentata*), or puncture wounds from the teeth of other males (Ellis, 1980; Hubbs, 1946; Leatherwood et al., 1982; McCann, 1974; Mead et al., 1982; Nishiwaki, 1962a; Pike, 1953; Rankin, 1953; Tomilin, 1957).

The two mandibular teeth in males erupt well outside the gum line and appear to pinch or constrict the upper jaw (Fig. 2). They tilt forward slightly and emerge from prominent arches, and often are worn on the lower front edge; teeth do not erupt in juveniles and females (Harmer, 1924; Leatherwood et al., 1982; Mead et al., 1982; Moore, 1963, 1966; Nishiwaki, 1962a, 1962b; True, 1910). Teeth are about 15 cm along the anterior border, 21 cm along the posterior border, 8 cm from anterior to posterior, and 0.8 cm thick (Norman and Fraser, 1949; Perrin and Myrick, 1980).

External measurements (in cm) reported by Nishimura and Nishiwaki (1964) for an adult male and an immature female, respectively, were: total length (tip of lower jaw to notch in tail fluke) 520, 236; tip of snout to anterior base of dorsal fin, 315, 145; tip of snout to anterior border on base of flipper, 105, 55; tip of snout to anus, 375, 172; tip of snout to angle of gape, 29, 14.8; tip of snout to eye slit, 57, 31; tip of snout to blowhole, 51.5, 28; tip of lower jaw to anterior end of base of tooth, 19.5, —; breadth of blowhole, 14.4, 7.4; length of right throat groove, 28.3, 15; flipper, anterior border to tip, 50, 29; breadth of flipper at base, 27, 14; dorsal fin anterior border to tip, 39, 19; flukes, total spread, 157.5, 61.5; tip of fluke to center, 78.5, 31.

DISTRIBUTION. *Mesoplodon stejnegeri* is rarely seen at sea, and its distribution generally has been inferred from stranded specimens (Fig. 3). It is endemic to the cold-temperate waters of the North Pacific Ocean, Sea of Japan, and deep waters of the southwest Bering Sea. The range extends along the coast of North America from Cardiff, California, north through the Gulf of Alaska to the Aleutian Islands, into the Bering Sea to the Pribilof Islands and Commander Islands, and, off Asia, south to Akita Beach on Noto Peninsula, Honshu in the Sea of Japan; this species is not known to enter the Arctic Ocean and is the only species of *Mesoplodon* known to occur in Alaskan waters (Fiscus et al., 1969; Jellison, 1953; Loughlin et al., 1982; Moore, 1963, 1966; Nishimura and Nishiwaki, 1964; Nishiwaki, 1962a, 1962b; Nishiwaki and Kamiya, 1958). Sightings of 52 *Mesoplodon*, probably *M. stejnegeri*, were made in 1979, primarily near the Andreanof Island group of the central Aleutian Islands; nine of these animals were seen near the Rat Islands and four near the Fox Islands (Loughlin et al., 1982). *Mesoplodon* off Japan may occur in waters less than 10°C (Nishimura and Nishiwaki, 1964).

The distribution of *M. stejnegeri* in the North Pacific corresponds closely, in occupying the same cold-temperate niche and position, to that of *M. bidens* in the North Atlantic. It lies principally between 50° and 60°N and extends only to about 45°N on the east (although a stranded specimen of *M. stejnegeri* was found at Cardiff, California, 33°N), but to about 40°N on the west (Moore, 1963, 1966). It occupies the equivalent niche in the North Pacific to that of the temperate species *M. bowdoini* in the South Pacific and Indian Ocean (Gaskin, 1982). *M. stejnegeri* (from about 60° to 40°N latitude) and *M. carlhubbsi* (from 54° to about 30°N) occupy largely complementary ranges that overlap from Oregon to British Columbia and off northern Japan (Mead et al., 1982; Moore, 1963; Moore and Gilmore, 1965; Pike and MacAskie, 1969).

The implication that *M. stejnegeri* occurs in southern hemisphere waters, based on McCann's (1976) use of *M. stejnegeri* for a southern hemisphere fetal skull, is incorrect.

FOSSIL RECORD. No fossils of *Mesoplodon* have been identified, although some fossil evidence suggests that modern ziphiids developed in early Miocene from squalodonts. The ziphioid line seems to have diversified early, after the Physeteridae, independently of the delphinid mainstream of odontocetes (Arnason et al.,

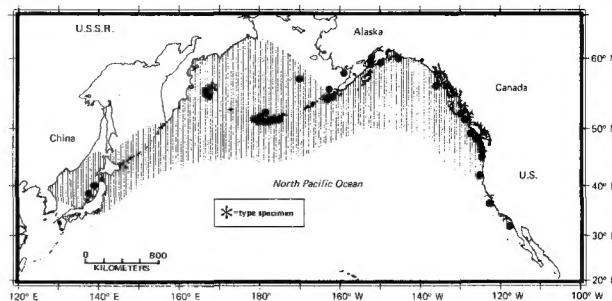


FIG. 3. Map showing localities of stranded specimens of *Mesoplodon stejnegeri*. Each stranding is shown by a dot; type locality is shown by an asterisk. The suggested distribution at sea is an approximation and not based on actual sightings.

1977; Gaskin, 1982). Common ancestry of the living ziphiids with the physeterids and kogiid seems likely, based on the morphology of the tympano-periotic bones; however, subsequent modifications have been great (Kasuya, 1973). Kellogg (1928a, 1928b) first concluded that beaked whales were derived from ancestors with numerous functional teeth in both jaws. By the upper Miocene, ziphiids similar to modern forms were becoming abundant (Kulu, 1972). Mead (1975) described an unnamed fossil beaked whale discovered during 1964 in late-middle Miocene sediments of northern Kenya which may be related to the ancestral forms of *Mesoplodon*. On the basis of morphology of skull elements (flat premaxillae), he concluded that *Mesoplodon* probably is related to the Miocene genera *Proroziphius* and *Belemniziphius*; *Mesoplodon* most likely was derived by the late Miocene (Kulu, 1972). Mead (1975) also concluded that the remainder of the Miocene ziphiid genera probably are related more closely to the extant *Ziphius*.

Based on characteristics of the number, alveolar shape, position of teeth, and some skull characteristics, *Mesoplodon* generally is regarded as more advanced than other ziphiid genera; *Tasmacetus* is the most primitive (Gaskin, 1982; Mead, 1975; Moore, 1968). *Hyperoodon* is the living genus most closely related to *Mesoplodon*, whereas *Berardius* and *Ziphius* are most distantly related (Moore, 1968). The genus has radiated to produce many species modified variously as to location of the pointed tip on the front, middle, or rear of the top edge of the tooth (Moore, 1968). Progressive retreat of the single pair of mandibular teeth from the apex of the mandible, and corresponding change of the orientation of the tooth from anterior inclination through vertical posture to strong posterior inclination suggests that the arrangement of the species of *Mesoplodon* on a primitive to derivative scale is: *M. hectori*, *M. mirus*, *M. europaeus*, *M. ginkgodens*, *M. grayi*, *M. carlhubbsi*, *M. bowdoini*, *M. stejnegeri*, *M. bidens*, and *M. layardii*; *M. densirostris* is also one of the most derivative *Mesoplodon* species, but it is not specifically at the end of progression in tooth evolution, and should be considered apart from the other species (Moore, 1968). Heyning (1984) believed that tooth position is of greater importance than inclination.

FORM AND FUNCTION. Mead (in Loughlin et al., 1982) speculated that the color variation of *Mesoplodon* individuals may be caused by dilation of blood vessels near the skin. An active animal may dissipate deep-body heat to the surrounding water and thus appear brown. Conversely, an inactive animal or one not undergoing thermal stress would appear gray to black. Rice (pers. comm.) speculated that light conditions may play a role in color variation as *Physeter* and *Berardius* are neutral gray but appear dark brown in bright sunlight, and greenish when under water.

Vertebral count probably is 7 cervical, 10 thoracic, 10 lumbar, and 19 caudal, totalling 46; cervicals 1 to 3 are fused (Nishiwaki, 1972). The first seven of 10 pairs of ribs are double-headed; there are 9 to 10 chevrons; the sternum is in five sections; flippers have five fingers and the phalangeal formula is I-1, II-5, III-4, IV-4, V-3 (Nishiwaki, 1972). The neural spines are unusually high (Howell, 1930). As in *M. europaeus* and *M. mirus*, the mesorostral groove may not ossify in adult females (Moore, 1963). The form of the rostrum and amount of ossification of rostral bones varies greatly with age and sex for the genus (Forbes, 1893). An array of cranial and postcranial measurements are presented in Moore (1963),

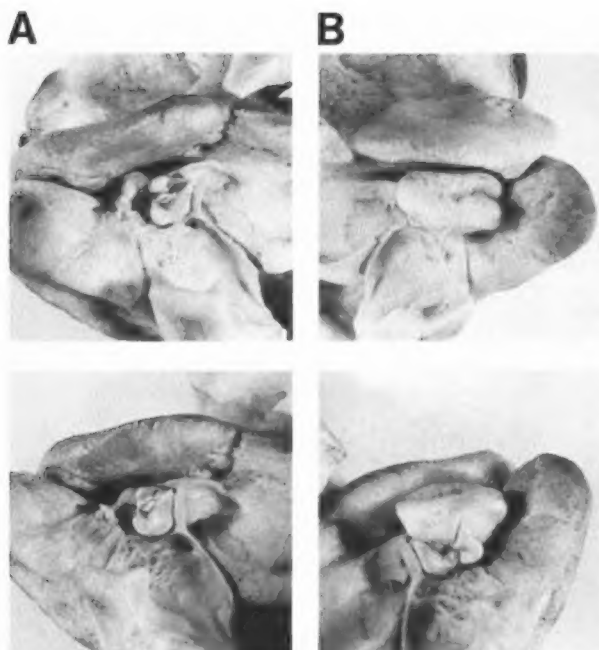


FIG. 4. Fused left tympanic bulla and periotic complex of *Mesoplodon stejnegeri*. A. Upper, ventral view of right side; lower, postero-lateral view of right side. B. Upper, ventral view of left side; lower, postero-lateral view of left side. Anterior is toward top of page in A and B, upper.

Nishimura and Nishiwaki (1964), Nishiwaki (1962a), Nishiwaki and Kamiya (1958), Orr (1953), True (1885, 1910) and others. The foramen magnum is small (True, 1910). The auditory region includes the ventrolaterally displaced tympanic and periotic bones (Fig. 4).

The tooth enamel is thin but commonly present, even in erupted teeth of old males. Prenatal dentine is more uniform in texture than postnatal and is of the same density (Perrin and Myrick, 1980). The neonatal line is a thin translucent layer followed by an adjacent opaque layer. Growth-layer groups are a thick layer of intermediate density bounded by a variable opaque or translucent layer. The pulp cavity becomes occluded at an early age resulting in deposition of irregular dentine or vasodentine. Cementum deposition varies by sex and is the reason for differences in size and shape of male and female teeth (Perrin and Myrick, 1980). The teeth probably are not used during feeding.

Ziphiid whales lack the forestomach or esophageal chamber of most other odontocetes, and their pyloric stomach is constricted to form up to 13 small chambers (Kenyon, 1961; Rice, 1984; Slijper, 1962).

The tongue of an immature female was whitish except for the anterior part, which was black and frilled on the lateral sides with tufts of protuberances (Nishimura and Nishiwaki, 1964).

The spermaceti-case region is near the blowhole and ascends gently toward the rear of the beak. Blubber thickness on the head is about 5 cm (Tomilin, 1957).

REPRODUCTION. Nothing is known regarding the estrous cycle, fertilization, implantation, or gestation period for this species; litter size doubtless is one and parturition likely occurs in spring or summer. Ovaries of an immature female weighed 2.6 g and those of a presumably mature female 12 g (Mead, 1984). Position of the testes was described for *M. bidens* and is probably similar for the genus (DeSmet, 1977). The testes are compressed and small, comparable to other cetaceans; each is at the end of a long pouch and enclosed within it. The pouch is a lateral component of the peritoneal cavity formed by lateral folds with the ureter and umbilical artery protruding into them. It is not a vaginalis peritonei or partial exorchidia as proposed by Anthony (1920).

Information on senility and mortality are lacking. Estimates of age for two specimens were obtained by counting growth-layer groups (GLGs) in tooth cementum; counts ranged from 2.8 to 10+ GLGs for a female and 10.5 to 30+ GLGs for a male. There are no estimates of longevity (Perrin and Myrick, 1980).

Milk composition was reported by Ullrey et al. (1984). Of note is the absence of lactose and the blue-green color caused by a biliverdin pigment.

ECOLOGY. *Mesoplodon stejnegeri* is believed to inhabit principally deeper waters of the continental slope, similar to the Atlantic species *M. bidens* (Moore, 1966; Morris et al., 1983). *M. stejnegeri* was observed at sea in waters ranging in depth from 730 to 1,560 m on the steep slope of the continental shelf as it drops off into the Aleutian Basin that exceeds 3,500 m in depth (Loughlin et al., 1982). Nothing is known about migratory behavior, if any, for this species.

No predators on *Mesoplodon* are known except man and possibly sharks. *M. stejnegeri* have been caught incidentally in salmon gill nets off Japan (Nishimura and Nishiwaki, 1964). There are few documented native or local fisheries for species of *Mesoplodon*, although pelagic tuna boats and fishermen using harpoons have caught *Mesoplodon* off Taiwan occasionally (Kasuya and Nishiwaki, 1971; McCann, 1964). Some populations of species of *Mesoplodon* possibly were harvested in the 19th century (and earlier) by American and other whalers (Mitchell, 1975).

Nematodes of the genus *Crassicauda* were found in the kidneys of one beached *M. stejnegeri* in the southeastern Bering Sea during 1977 (Shults et al., 1982). Remains (nine scolices and a few strobilar fragments) of the cestode *Tetrabothrius forsteri* were found in the small intestine of another stranded *M. stejnegeri* from Cook Inlet, Alaska (Shults et al., 1982). However, in addition to *T. forsteri*, the trematode *Monostomum delphini*; the cestodes *Strobilcephalus triangularis* and *Phyllobothrium delphini*; the nematodes *Anisakis simplex*, *Crassicauda anthonyi*, and *C. boopis*; and the acanthocephalan *Bolbosoma vasculosum* have been found in other species of *Mesoplodon* (Arvy, 1974; Chabaud, 1963; Dailley and Brownell, 1972; Delyamure, 1968; Mead, 1981; Mousset and Duperier, 1956; Zam et al., 1971). Information on the pathology of diseases has not been recorded for *M. stejnegeri*.

Population estimates are unavailable for *M. stejnegeri*, although it likely occurs in low numbers. Strandings are fairly common on the Aleutian Islands, and this species may be more common in that area (Leatherwood and Reeves, 1983). Sailors or fishermen seldom encounter them on the high seas (Nishiwaki, 1966). Their rarity undoubtedly is related, in part, to their wide pelagic distribution in deep water and their inconspicuousness at sea (Loughlin et al., 1982).

The primary food of *M. stejnegeri* probably is squid (Moore, 1963; Tomilin, 1957). Stomachs of stranded or caught specimens of *Mesoplodon* have contained remains of squid (Mead, 1981; Mead et al., 1982; Sullivan and Houck, 1979). Many species of *Mesoplodon* probably feed on cephalopods from depths below 100 m, as ziphiids are generally deep divers (Madsen and Herman, 1980). Gaskin (1982) and Yablokov et al. (1972) stated that the Ziphiidae are obligate teuthophages (squid-eaters) based on their tooth structure; however, they probably also eat fish. Scheffer and Slipp (1948) quoted a Makah Indian of Washington state who stated that beaked whales thought to be of this species were seen in Neah Bay "1/2 to 1 mile offshore on the salmon trolling grounds." Likewise, Nishimura and Nishiwaki (1964) mentioned the possibility of this species "pursuing salmon as a rapacious predator" because two *M. stejnegeri* were trapped in salmon gill nets. Nishiwaki (1966) also stated that *M. stejnegeri* was seen to chase a salmon school off Japan. Other species of *Mesoplodon* eat fish (Madsen and Herman, 1980; Mead et al., 1982), and *M. ginkgodens* may follow migrating sardines (Nishiwaki and Kamiya, 1958). Some of the otoliths found with squid beaks in stomachs of *Mesoplodon* could have been eaten first by some of the squid (Mead et al., 1982).

Slijper (1962) suggested that beaked whales apparently seize squid with the edges of their jaws then squeeze them back to the throat. Pike (1953) suggested that the teeth may act as "guard rails" by forming a groove or trough to keep squid and fish on the right path towards the throat.

The Makah Indians of Washington once tried to eat the blubber and flesh of *Mesoplodon*, but it caused diarrhea (Scheffer and Slipp, 1948), although Hubbs (1946) stated that the meat of *M. carlhubbsi* had good flavor and was tender when roasted or fried. Mead et al. (1982) noted that the blubber in *Mesoplodon* may produce diarrhea; however, several people have eaten *Mesoplodon* meat and found it palatable.

BEHAVIOR. Few *M. stejnegeri* have been observed alive; none has been held in captivity. Whalers' reports indicate that this

species usually is encountered alone or in small groups of two or three animals (Scheffer and Slipp, 1948). However, individuals of *Mesoplodon*, presumably *M. stejnegeri*, were sighted in the Bering Sea on seven occasions during 1979 in pods that ranged from five to 15 animals and totaled 52 animals (Loughlin et al., 1982). On one occasion, two pods were seen about 2 km apart. The first pod contained 12 animals and the second 15. The animals appeared to be traveling abreast, almost touching each other; they surfaced and submerged in unison. The pod made a series of approximately five or six shallow dives with considerable time at the surface, followed by a longer dive of 10 to 15 minutes. On five other occasions, pods ranging from three to seven animals were seen. Surfacing of some animals were followed by slow casual rolls. Animals usually were more than 1 km from the vessel. Generally, they seemed to show tight grouping with the animals also appearing to touch each other. They often had low blows when visible, and sometimes sounded together (Loughlin et al., 1982). Scheffer and Slipp (1948) quoted a Makah Indian who stated that *Mesoplodon* blows once or twice between soundings. They probably swim at speeds of 3 to 4 knots with a maximum of 6 knots (Bruyns, 1971).

The infrequency with which beaked whales are encountered at sea may reflect their rarity, or it may be simply the result of their behavioral characteristics such as a low, inconspicuous blow, avoidance of ships although they may not be afraid of canoes (Scheffer and Slipp, 1948), distribution in small groups in offshore areas well outside normal shipping lanes, and being confused with more common species when viewed under suboptimal conditions (Leatherwood et al., 1982; Loughlin et al., 1982). Beaked whales may have some type of social structure and, based on the small pod size, are more solitary than most delphinids. Animals in each pod were observed to swim and dive in unison and were tightly bunched, suggesting group cohesiveness; the groups were composed of both small and large animals suggesting intermingling of ages and sexes (Loughlin et al., 1982).

Nothing is known about the reproductive behavior of *M. stejnegeri*.

Vocalization has not been studied in *M. stejnegeri*; however, Poulter (1968) indicated that members of this genus produce sounds described variously as "roars, lowing and sobbing groans," although no recordings were made.

GENETICS. The chromosomes of *M. stejnegeri* have not been studied. The chromosome number of *M. carlhubbsi* and *M. europaeus* is $2n = 42$; the karyotypes are morphologically similar in both species, and each has a large X-chromosome because of accumulation of C-heterochromatin, although there were species differences in the number of C-blocks (Arnason, 1981; Arnason et al., 1977). The *Mesoplodon* X-chromosome is the largest X so far found in cetaceans (Arnason et al., 1977). The $2n = 42$ beaked-whale karyotype is presumed to have evolved from the general $2n = 44$ odontocete karyotype through a fusion of two pairs of chromosomes (Arnason et al., 1977).

REMARKS. Other common names include Bering Sea beaked whale, saber-tooth whale, oogihā kujira (Japanese), remnezub Stejnegera (Russian), malý plavun (Russian), kigan agalyusyak (Aleut), and kwow-kwow-e-acht-le (Makah Indian). Individual variation remains virtually unexplored for *Mesoplodon*, and ontogenetic changes have been described only for *M. europaeus* (Moore, 1968).

LITERATURE CITED

- ANTHONY, R. 1920. L'exorchidie du *Mesoplodon* et la remontée des testicules au cours de la phylogénèse de cétacés. C. R. Acad. Sci., Paris, 170:529-531. (Not seen; cited in DeSmet, 1977)
- ARNASON, U. 1981. Localization of NORs in cetacean karyotypes. Hereditas, 95:269-275.
- ARNASON, U., K. BENIRSCHKE, J. G. MEAD, AND W. W. NICHOLS. 1977. Banded karyotypes of three whales: *Mesoplodon europaeus*, *M. carlhubbsi* and *Balaenoptera acutorostrata*. Hereditas, 87:189-200.
- ARVY, L. 1974. The kidney, renal parasites and renal secretion in cetaceans. Pp. 231-310, in Investigations on Cetacea (G. Pilleri, ed.). 'Der Bund,' Berne, Switzerland, 5:1-365.
- BRUYNs, W. F. J. M. 1971. Field guide of whales and dolphins. Uitgeverij tor/n.v. Uitgeverij v.h. C. A. Mees, Amsterdam, 258 pp.
- CHABAUD, A. G. 1963. Description de *Crassicauda anthonyi* n. sp. nematode parasite renal de *Mesoplodon mirus*, True. Bull. Mus. Natl. Hist. Nat. (Paris), 34:397-403. (Not seen; cited in Dailey and Brownell, 1972)
- DAILEY, M. D., AND R. L. BROWNELL, JR. 1972. A checklist of marine mammal parasites. Pp. 528-589, in Mammals of the sea, biology and medicine (S. H. Ridgway, ed.). Charles C. Thomas, Springfield, Illinois, 812 pp.
- DELYAMURE, S. L. 1968. Helminthofauna of marine mammals (ecology and phylogeny). Izd. Akademii Nauk, USSR, Moscow. (In Russian; translated by Israel Program for Scientific Transl., Jerusalem, 522 pp)
- DESMET, W. M. A. 1977. The position of the testes in cetaceans. Pp. 361-386, in Functional anatomy of marine mammals (R. J. Harrison, ed.). Academic Press, London, 3:1-428.
- DUVERNOY, G. L. 1851. Mémoire sur les caractères ostéologiques des genres nouveaux ou des espèces nouvelles des Cétacés vivants et fossiles, dont les squelettes entiers, ou les têtes seulement, sont conservés dans les galeries d'anatomie comparée du Muséum d'Histoire Naturelle. Ann. Sci. Nat. (Zool.), 15:5-71, 381. (Not seen; cited in Royal Soc. Cat. Sci. Papers, 1800-1863, 2:430)
- ELLIS, R. 1980. The book of whales. Alfred A. Knopf, New York, 202 pp.
- ESCHRICHT, D. F. 1849. Undersøgelser over Hvaldyrene. Kiøbenhavn danske Vidensk. Selsk. Skr., Ser. 5, vol. 1:85-138. (Not seen; cited in Royal Soc. Cat. Sci. Papers, 1800-1863, 2:518)
- FISCUS, C. H., D. W. RICE, AND A. M. JOHNSON. 1969. New records of *Mesoplodon stejnegeri* and *Ziphius cavirostris* from Alaska. J. Mamm., 50:127.
- FORBES, H. O. 1893. Observations on the development of the rostrum in the cetacean genus *Mesoplodon*, with remarks on some of the species. Proc. Zool. Soc. London, 1893:216-236 + 4 plates.
- GASKIN, D. E. 1971. Distribution of beaked whales (Cetacea: Ziphiidae) off southern New Zealand. New Zealand J. Mar. Freshwater Res., 5:318-325.
- . 1982. The ecology of whales and dolphins. Heinemann, Exeter, New Hampshire, 459 pp.
- GERVAIS, P. 1850a. Mémoire sur la famille des cétacés Ziphoides, et plus particulièrement sur le *Ziphius cavirostris* de la Méditerranée, Ann. Sci. Nat., Zool., 14:5-17.
- . 1850b. Recherches sur les Cétacés du genre *Ziphius*, de Cuvier, et plus particulièrement sur le *Ziphius cavirostris*. Compte Rendu de L'Académie Sci., Paris, 31:510-512.
- GRAY, J. E. 1866. Catalogue of seals and whales in the British museum. Trustees of the Museum, London, 402 pp.
- . 1871a. Note on a new Australian ziphioid whale: *Calidion*. Ann. Mag. Nat. Hist., 7:368. (Not seen; cited in Royal Soc. Cat. Sci. Papers, 7:826)
- . 1871b. Supplement to the catalogue of seals and whales in the British museum. Trustees of the Museum, London, 103 pp.
- HAAST, J. VON. 1876. Further notes on *Oulodon*, a new genus of ziphioid whales from the New-Zealand seas. Proc. Zool. Soc. London, 1876:457-458.
- HARMER, S. F. 1924. On *Mesoplodon* and other beaked whales. Proc. Zool. Soc. London, 1924:541-587 + 4 plates.
- HEYNING, J. E. 1984. Functional morphology involved in intra-specific fighting of the beaked whale, *Mesoplodon carlhubbsi*. Canadian J. Zool., 62:1645-1654.
- HOWELL, A. B. 1930. Aquatic mammals: their adaptations to life in the water. Dover Publ., Inc., New York, 338 pp.
- HUBBS, C. L. 1946. First records of two beaked whales, *Mesoplodon bowdoini* and *Ziphius cavirostris* from the Pacific coast of the United States. J. Mamm., 27:242-255.
- JELLISON, W. L. 1953. A beaked whale, *Mesoplodon* sp., from the Pribilofs. J. Mamm., 34:249-251.
- KASUYA, T. 1973. Systematic consideration of recent toothed whales based on the morphology of tympano-periotic bone. Sci. Rept. Whales Res. Inst., 25:1-103.
- KASUYA, T., AND M. NISHIWAKI. 1971. First record of *Mesoplodon densirostris* from Formosa. Sci. Rept. Whales Res. Inst., 23:129-137.
- KELLOGG, R. M. 1928a. The history of whales—their adaptation to life in the water. Quart. Rev. Biol., 3:29-76.
- . 1928b. The history of whales—their adaptation to life in the water (concluded). Quart. Rev. Biol., 3:174-208.

- KENYON, K. W. 1961. Cuvier beaked whales stranded in the Aleutian Islands. *J. Mamm.*, 42:71-76.
- KULU, D. D. 1972. Evolution and cytogenetics. Pp. 503-527, in *Mammals of the sea, biology and medicine* (S. H. Ridgway, ed.). Charles C Thomas, Springfield, Illinois, 812 pp.
- LEATHERWOOD, S., AND R. R. REEVES. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco, 302 pp.
- LEATHERWOOD, S., R. R. REEVES, W. F. PERRIN, AND W. E. EVANS. 1982. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent arctic waters: a guide to their identification. NOAA Tech. Rept. Natl. Marine Fish. Serv. Cir., 444: 1-245.
- LESSON, R. P. 1828. Cétacés. Vol. 1 of *Complément des oeuvres de Buffon ou Histoire Naturelle des animaux rares découverts par les naturalistes et les voyageurs depuis la mort de Buffon*, Baudouin Frères, Paris, 422 pp.
- LOUGHLIN, T. R., C. H. FISCUS, A. M. JOHNSON, AND D. J. RUGH. 1982. Observations of *Mesoplodon stejnegeri* (Ziphiidae) in the central Aleutian Islands, Alaska. *J. Mamm.*, 63:697-700.
- MADSEN, C. J., AND L. M. HERMAN. 1980. Social and ecological correlates of cetacean vision and visual appearance. Pp. 101-147, in *Cetacean behavior—mechanisms and functions* (L. M. Herman, ed.). Wiley-Interscience, New York, 463 pp.
- MCCANN, C. 1964. The female reproductive organs of Layard's beaked-whale *Mesoplodon layardi* (Gray). *Rec. Dominion Museum (Wellington)*, 4:311-316.
- . 1974. Body scarring on Cetacea-odontocetes. *Sci. Rept. Whales Res. Inst.*, 26:145-155.
- . 1976. Note of the foetal skull of *Mesoplodon stejnegeri*. *Sci. Rept. Whales Res. Inst.*, 28:107-117.
- MEAD, J. G. 1975. A fossil beaked whale (Cetacea:Ziphiidae) from the Miocene of Kenya. *J. Paleontol.*, 49:745-751.
- . 1981. First records of *Mesoplodon hectori* (Ziphiidae) from the northern hemisphere and a description of the adult male. *J. Mamm.*, 62:430-432.
- . 1984. Survey of reproductive data for the beaked whales (Ziphiidae). *Rept. Internatl. Whaling Comm., Spec. Issue* 6:91-96.
- MEAD, J. G., W. A. WALKER, AND W. J. HOUCK. 1982. Biological observations on *Mesoplodon carlhubbsi* (Cetacea:Ziphiidae). *Smithsonian Contrib. Zool.* 344:1-25.
- MITCHELL, E. 1975. Porpoise, dolphin and small whale fisheries of the world status and problems. *Internatl. Union Conserv. Nat. Monogr.*, 3:1-129.
- MOORE, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. *Amer. Midland Nat.*, 70:396-428.
- . 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. Pp. 32-61, in *Whales, dolphins and porpoises* (K. S. Norris, ed.). Univ. California Press, Berkeley, 789 pp.
- . 1968. Relationships among the living genera of beaked whales with classifications, diagnoses and keys. *Fieldiana-Zool.*, 53:209-298.
- MOORE, J. C., AND R. M. GILMORE. 1965. A beaked whale new to the western hemisphere. *Nature*, 205:1239-1240.
- MORRIS, B. F., M. S. ALTON, AND H. W. BRAHAM. 1983. Living marine resources of the Gulf of Alaska. NOAA Tech. Memo., Natl. Marine Fish. Serv., F/AKR-5:1-232.
- MOUSSET, G., AND R. DUPERIER. 1956. Note sur le *Mesoplodon mirus*. *Bull. Cente Et. Rech. Sci. Biarritz*, 1:33-39.
- NISHIMURA, S., AND M. NISHIWAKI. 1964. Records of the beaked whale *Mesoplodon* from the Japan Sea. *Publ. Seto Mar. Biol. Lab.*, 12:51-62 + 14 plates.
- NISHIWAKI, M. 1962a. *Mesoplodon bowdoini* stranded at Akita Beach, Sea of Japan. *Sci. Rept. Whales Res. Inst.*, 16:61-77 + 5 plates.
- . 1962b. Observation on two mandibles of *Mesoplodon*. *Sci. Rept. Whales Res. Inst.*, 16:79-81 + 2 plates.
- . 1966. Distribution and migration of marine mammals in the North Pacific area. *Proc. 11th Pacific Sci. Congr. Symp.* 4:1-49.
- . 1972. General biology. Pp. 3-294, in *Mammals of the sea, biology and medicine* (S. H. Ridgway, ed.). Charles C Thomas, Springfield, Illinois, 812 pp.
- NISHIWAKI, M., AND T. KAMIYA. 1958. A beaked whale *Mesoplodon* stranded at Oiso Beach, Japan. *Sci. Rept. Whales Res. Inst.*, 13:53-83 + 17 plates.
- NORMAN, J. R., AND F. C. FRASER. 1949. Fieldbook of giant fishes. G. P. Putnam's Sons, New York, 376 pp.
- OLIVER, W. R. B. 1922. A review of the Cetacea of the New Zealand seas. *Proc. Zool. Soc. London*, 1922:557-585.
- ORR, R. T. 1953. Beaked whale (*Mesoplodon*) from California, with comments on taxonomy. *J. Mamm.*, 34:239-249.
- PERRIN, W. F., AND A. C. MYRICK, JR., 1980. Age determination of toothed whales and sirenians. *Internatl. Whaling Comm., Spec. Issue*, 3:1-229.
- PIKE, G. C. 1953. Two records of *Berardius bairdi* from the coast of British Columbia. *J. Mamm.*, 34:98-104.
- PIKE, G. C., AND I. B. MACASKIE. 1969. Marine mammals of British Columbia. *Bull. Fish. Res. Board Canada*, 171:9-11.
- POULTER, T. C. 1968. Marine mammals. Pp. 405-465, in *Animal communication: techniques of study and results of research* (T. A. Sebeok, ed.). Indiana Univ. Press, Bloomington, 686 pp.
- RANKIN, J. J. 1953. First record of the rare beaked whale, *Mesoplodon europaeus*, Gervais, from the West Indies. *Nature*, 172:873-874.
- RICE, D. W. 1984. Cetaceans. Pp. 447-490, in *Orders and families of Recent mammals of the world* (S. Anderson and J. K. Jones, Jr., eds.). John Wiley & Sons, Inc., New York, 686 pp.
- RICE, D. W., AND K. E. KINMAN. 1980. *Mesoplodon* Gervais, 1850 (Mammalia:Cetacea): proposed conservation. *Z.N. (S)2081. Bull. Zool. Nomencl.*, 37:30-33.
- SCHAEFFER, V. B., AND J. W. SLIPP. 1948. The whales and dolphins of Washington state with a key to the cetaceans of the west coast of North America. *Amer. Midland Nat.*, 39:257-337.
- SHULTS, L. M., F. H. FAY, AND J. D. HALL. 1982. Helminths from Stejneger's beaked whale *Mesoplodon stejnegeri* and Risso's dolphin *Grampus griseus* in Alaska. *Proc. Helminthol. Soc. Washington*, 49:146-147.
- SLIJPER, E. J. 1962. Whales. Basic Books, Inc., New York, 475 pp.
- SOWERBY, J. 1804. Extracts from the minute-book of the Linnean Society, Mar. 20. *Trans. Linnean Soc.*, 7:310.
- SULLIVAN, R. M., AND W. J. HOUCK. 1979. Sightings and strandings of cetaceans from northern California. *J. Mamm.*, 60: 828-833.
- TOMILIN, A. G. 1957. Adaptive types in the order Cetacea (the problem of an ecological classification of Cetacea). *Zool. Zhurnal*, 33:677-692. (In Russian; translated by Foreign Language Div., Sec. State, Canada)
- TRUE, F. W. 1885. Contributions to the history of the Commander Islands. No. 5—Description of a new species of *Mesoplodon*, *M. stejnegeri*, obtained by Dr. Leonard Stejneger, in Bering Island. *Proc. U.S. Natl. Mus.*, 8:584-585.
- . 1910. An account of the beaked whales of the family Ziphiidae in the collection of the United States National Museum, with remarks on some specimens in other American museums. *Bull. U.S. Natl. Mus.*, 73:1-89 + 42 plates.
- ULLREY, D. E., ET AL. 1984. Blue-green color and composition of Stejneger's beaked whale (*Mesoplodon stejnegeri*) milk. *Comp. Biochem. Physiol.*, 79B:349-352.
- WAGNER, J. A. 1846. Saugthiere, Vol. VII, pages 1-427, as continuation of: Schreber, J.C.D., 1774 to 1855, *Die Saugthiere in Abbildungen nach der Natur mit Beschreibungen. Erlangen* (Wather). (Not seen; cited in Sherborn, 1891. On the dates of the parts, plates, and text of Schreber's 'Saugthiere.' *Zool. Society, London*, 1891:587-592.)
- YABLOKOV, A. V., V. M. BEL'OVICH, AND V. I. BORISOV. 1972. Whales and dolphins, Part II, pp. 245-548. *Izd-vo Nauka, Moscow*. (In Russian; translated by U.S. Joint Publ. Res. Serv., available at Natl. Tech. Inf. Serv., Springfield, Virginia, as JPRS 62150-2)
- ZAM, S. G., D. K. CALDWELL, AND M. C. CALDWELL. 1971. Some endoparasites from small odontocete cetaceans collected in Florida and Georgia. *Cetology*, 2:1-11.

Editors of this account were B. J. VERTS and J. K. JONES, JR. Managing editor was TIMOTHY E. LAWLOR.

T. R. LOUGHLIN AND M. A. PEREZ, NATIONAL MARINE MAMMAL LABORATORY, NATIONAL MARINE FISHERIES SERVICE, NOAA, 7600 SAND POINT WAY NE, SEATTLE, WASHINGTON 98115.